Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (canceled)

2. (currently amended) The computer system of claim [[1]] 7, wherein the intermediate block data container is located in a memory location that is external to the computer file system.

3. (original) The computer system of claim 2, wherein the intermediate block data container is located in the storage device.

4. (original) The computer system of claim 3, wherein the intermediate block data container is a separate partition of the storage device.

5. (currently amended) The computer system of claim [[1]] 7, wherein the intermediate block data container is a file within the file system.

6. (currently amended) The computer system of claim [[1]] 7, wherein the file system is further operable to write dirty pages to the storage device before initiating a data backup process.

7. (currently amended) A computer system operable to provide backup copying of data without suspending an application program accessing the data, comprising:

a storage device operable to store block data;

a backup storage device operable to store block backup data and operable to restore the storage device multiple times and to any prior consistent state of the storage device stored as the block backup data; and

an intermediate block data container operable to store block backup data, wherein the computer system is operable to copy a data block from the storage device into the intermediate

block data container and copy a data block from the intermediate block data container into the backup storage device during an online data backup process, and wherein the intermediate block data container is protected from data overwrite during the online backup process; and

wherein the computer system is operable to manage the online data backup process by:

compiling a list of data storage blocks located in the storage device that are subject to the data backup process;

copying a data storage block to the backup storage device pursuant to the list of data storage blocks; and

suspending a write command that is directed to a data storage block that is subject to the data backup process but has not yet been copied, copying the data storage block that is the subject of a write command to the intermediate storage device, executing the write command and copying the data storage block from the intermediate storage device to the backup storage device ~~The computer system of claim 1~~,

wherein the computer system is operable to:

suspend a write command to the storage device during the data backup process if the intermediate block data container has reached a selected data capacity; and

copy a selected amount of data from the intermediate block data container to the backup storage device.

8. (previously presented) The computer system of claim 21, wherein the file system driver is translates a write request addressed to a file located in the storage device received from a user process into one or more block write operations.

9. (previously presented) The computer system of claim 21, wherein the file system driver transmits a write request received from an operating system process.

10. (previously presented) The computer system of claim 21, wherein the file system driver provides a data block number associated with a block in response to a write command directed to the data block during the online data backup process.

11. (currently amended) A method for providing an online data backup process for backing up data stored on a storage device associated with a computer system to a backup storage device, comprising:

    providing an intermediate data container;

    informing an operating system driver that the data is in a backup state;

    compiling a list of data blocks located in the storage device that are subject to the online data backup process;

    receiving a write operation directed to a listed data block subject to the online data backup process;

    determining if the listed data block has been copied;

    executing the write operation if the listed data block has been copied; and

    suspending the write operation if the listed data block has not been copied, copying the listed data block to the intermediate block data container, and executing the write operation,

    wherein the backup storage device is operable to restore the storage device multiple times and to any prior consistent state of the storage device stored as the block backup data, and wherein the intermediate data container is protected from data overwrite during the online backup process; and

    upon receiving an indication that the intermediate block data container is close to overload, the initiating a temporary slowdown of write operations by slowing down processes whose activity results in write operations into a non-backed-up area.

12. (original) The method of claim 11, further comprising the step of copying the listed data block from the intermediate block data container to a backup storage device.

13. (original) The method of claim 11, further comprising flagging a data block once the data block has been copied to the backup storage device.

14. (original) The method of claim 11, further comprising the step of informing the operating system driver that all of the data blocks subject to the online data backup process have been copied to the backup storage device.

15. (original) The method of claim 11, further comprising the step of receiving a data block number associated with the listed data block upon receiving a write operation directed to a listed data block.

16. (original) The method of claim 11, further comprising the step of writing a dirty page to the storage device before informing an operating system driver that the data is in a backup state.

17. (original) The method of claim 11, wherein the step of providing the intermediate block data container further comprises the step of providing a storage device external to the computer system.

18. (original) The method of claim 11, wherein the step of providing the intermediate block data container further comprises the step of providing a selected section of the storage device.

19. (original) The method of claim 11, wherein the step of providing the intermediate block data container further comprises the step of providing a selected file located in a file system associated with the computer system.

20. (original) The method of claim 11, wherein the step of suspending the write operation if the listed data block has not been copied, further comprises the steps of:

determining whether the intermediate block data storage has reached a selected capacity;
and

copying a selected portion of the intermediate block data storage to the backup storage
device if the intermediate block data storage has reached the selected capacity.

21. (previously presented) The computer system of claim 11, further comprising:

a file system driver operable to transmit a write request to write to the storage device; and

a storage device driver program operable to read from the storage device and write to the
storage device in block mode in response to the write request.

22. (canceled)

23. (previously presented) The method of claim 11, wherein a list of data blocks located
in the storage device that are subject to the online data backup process includes all blocks of an
underlying storage device used by file system data and does not don't include free space blocks.

24. (currently amended) A system for data backup, comprising:

a storage device;

a backup storage device operable to restore the storage device multiple times and to any
prior consistent state of the storage device stored as the block backup data; and

an intermediate storage device, wherein the intermediate storage device is protected from
data overwrite during an online backup process,

wherein, when a write command is directed to a data storage block identified for backup
that has not yet been backed up, the identified data storage block is copied from the storage
device to the intermediate storage device, the write command is executed on the data storage

block in the intermediate storage device, and the data storage block is copied from the intermediate storage device to the backup storage device,

wherein the system:

suspends a write command to the storage device during the data backup process if the intermediate storage device has reached a selected data capacity; and
copies a selected amount of data from the intermediate storage device to the backup storage device.

25. (canceled)

26. (currently amended) The system of claim [[25]] 24, wherein the intermediate storage device is located in the storage device.

27. (previously presented) The system of claim 26, wherein the intermediate storage device is a separate partition of the storage device.

28. (currently amended) The system of claim [[25]] 24, wherein the intermediate storage device is a file within the file system.

29. (previously presented) The system of claim 28, wherein the file system writes dirty pages to the storage device before initiating a data backup process.

30. (canceled)

31. (currently amended) The system of claim [[25]] 24, further comprising:

a file system driver for transmitting the write command to the storage device; and
a storage device driver program for reading from the storage device and writing to the storage device in block mode in response to the write command.

32. (previously presented)   The system of claim 31, wherein the file system driver translates the write command received from a user process and addressed to a file located in the storage device into one or more block write operations.

33. (previously presented)   The system of claim 31, wherein the file system driver transmits the write command received from an operating system process.

34. (previously presented)   The system of claim 31, wherein the file system driver provides a data block number associated with a block in response to the write command directed to the data block during an online backup.

35. (new) The system of claim 24, further comprising means for slowing down processes whose activity results in write operations into a nonbacked-up area, in response to an indication that the intermediate storage device is close to overload.

36. (previously presented) The system of claim 24, wherein data blocks in the storage device that are subject to the online data backup process includes all blocks of an underlying storage device used by file system data and does not include free space blocks.

37. (previously presented) The system of claim 24, wherein backed up data blocks are restored on the fly to a different storage device.

38. (previously presented) The system of claim 24, wherein an order in which data blocks are scheduled for backup is changed based on information received from an external source.

39. (currently amended) A method for providing an online data backup, comprising:

providing an intermediate storage;

informing an operating system driver that data in the storage device is in a backup state;

identifying data blocks in the storage device subject to the online data backup;

receiving a write command directed to an identified data block;

determining if the listed data block has been copied;

proceeding with a write operation if the identified data block has been copied; and

suspending the write operation if the identified data block has not been copied, copying the identified data block to the intermediate storage, and executing the write operation on the data block in the intermediate storage,

wherein the storage device is operable to be restored multiple times and to any prior consistent state of the storage device stored as block backup data, and wherein the intermediate storage is protected from data overwrite during the online data backup,

wherein suspending the write operation comprises:

determining whether the intermediate storage has reached a selected capacity; and

copying a selected portion of the intermediate storage to the backup storage device if the intermediate storage has reached the selected capacity.

40. (previously presented)   The method of claim 39, further comprising the step of copying the identified data block from the intermediate storage to a backup storage device.

41. (previously presented)   The method of claim 39, further comprising flagging a data block once the data block has been copied to the backup storage device.

42. (previously presented)   The method of claim 39, further comprising informing an operating system driver that all the identified data blocks have been copied to the backup storage device.

43. (previously presented) The method of claim 39, further comprising receiving a data block number associated with the identified data block upon receiving the write command directed to the identified data block.

44. (previously presented) The method of claim 39, further comprising writing a dirty page to the storage device before informing an operating system driver that the data is in the backup state.

45. (previously presented) The method of claim 39, wherein the step of copying comprises copying the identified data block to intermediate storage, wherein the intermediate storage comprises an external storage device.

46. (previously presented) The method of claim 39, wherein providing the intermediate storage further comprises providing a selected partition of the storage device.

47. (previously presented) The method of claim 39, wherein the step of providing the intermediate storage further comprises the step of providing a selected file located in a file system associated with the computer system.

48. (canceled)

49. (previously presented) The method of claim 39, further comprising, upon receiving an indication that the intermediate data storage is close to overload, the initiating a temporary slowdown of write operations by slowing down processes whose activity results in write operations into a non-backed-up area.

50. (previously presented) The method of claim 39, wherein a list of data blocks located in the storage device that are subject to the online data backup process includes all blocks of an underlying storage device used by file system data and does not include free space blocks.

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51. (previously presented) The method of claim 39, further comprising informing an operating system driver that data in a storage device is in a backup state.

52. (previously presented) The method of claim 39, wherein backed up data blocks are restored on the fly to a different storage device.

53. (previously presented) The method of claim 39, wherein an order in which data blocks are scheduled for backup is changed based on information received from an external source.

54. (canceled)